SA NUMERACY CHAIR PROJECT

eNICLE Grade 1 and 2
Teacher Development Programme

Session Three Teacher Handbook

Maths is fun

To access resources for this session, scan this QR code on your phone to go directly to the resources page:

Name

_____

School

_____

To cite this document:
South African Numeracy Chair Project. (2017). eNICLE Grade 1 & 2 Teacher Development Programme: Session Three Teacher Handbook. Grahamstown, South Africa: South African Numeracy Chair Project (Rhodes University).

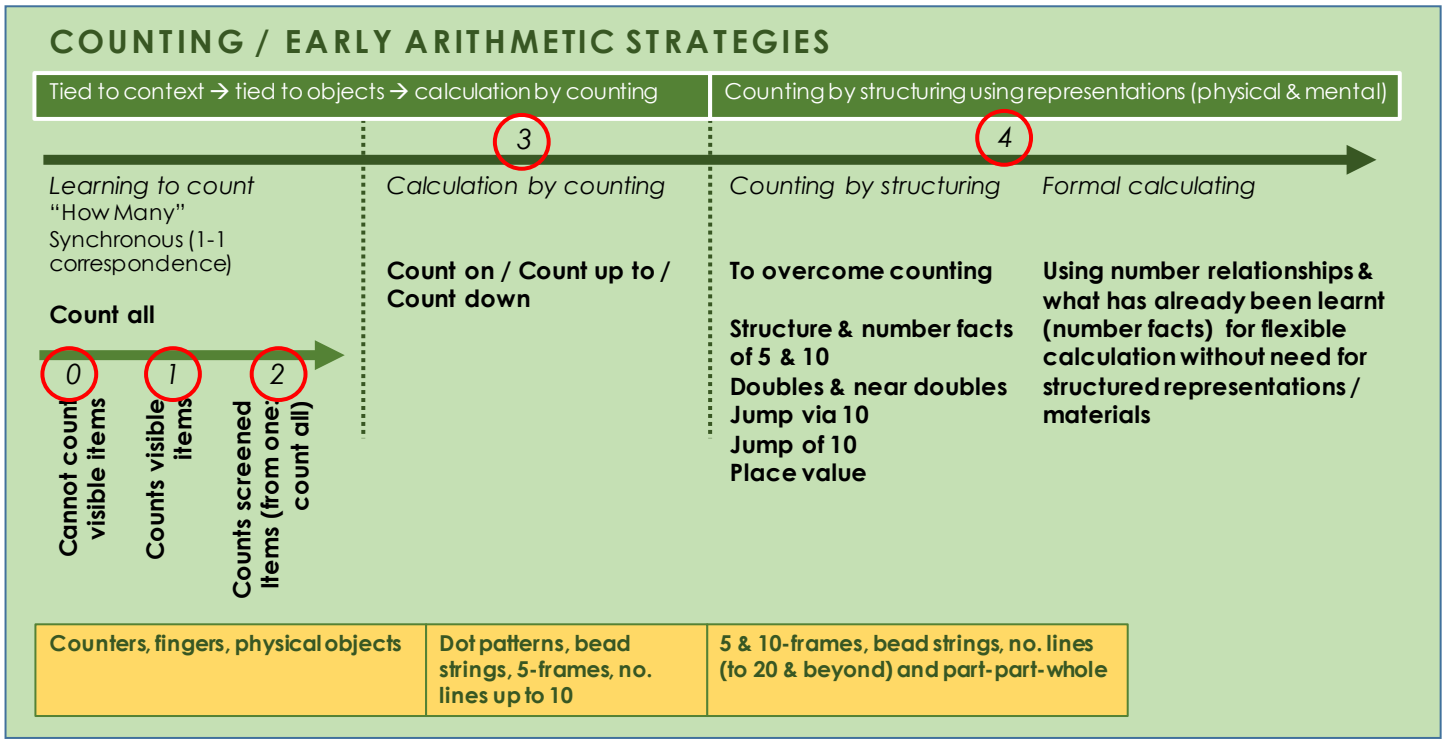
Table of contents

Summary of the key ideas behind the activities in this session

In the broad introduction in session one we explained the key ideas we focus on across the programme. Here we will summarise the key ideas that are the focus of today's session (Session 3).

Progression

In the first session we looked at a progression spectrum for counting / early arithmetic strategies.



The story activities that we focus on in this session enable progression:

- from context bound calculating to object bound counting and calculating
- structure and number facts of 5

Assessment

In this session, we introduce assessment activities that allow you to determine where learners are in their mathematical learning, so that you can design learning activities to help progress learners, especially in their counting and early arithmetic strategies.

The assessments are intended to be formative and are aimed at helping you establish where your learners are in their mathematical learning and how to encourage them to progress. Remember, not all children will be able to do all the tasks, this is the point of the assesment.

The assessments assess a variety of concepts, see page 11 for further information.

Using story (narrative) approaches for developing number sense

In this session our focus is on providing stories that give learners contexts for context-bound counting and progressions to object-bound counting. This area of progression is highlighted in the diagram below.

All children love a good story and especially love to interact with stories as they unfold. They show wonderful expressions of a wide range of emotions as stories unfold. Stories and books are also excellent for language and literacy development, developing learner concentration skills. They are also great for developing number sense when numbers are built into stories.

In this session we use provide the first of a series of story-books that have been written to support the transition from context based counting to object bound counting. Using story-books with images, and through encouraging learners to answer questions and represent what is happening in the stories with their fingers and puppets, learners will be supported in developing skills of:

- Context bound counting and calculating
  (1-5 in the first 2 stories 1-10 in the 3rd)
- Object bound counting and calculating
  (1-5 in the first 2 stories 1-10 in the 3rd)
- numeral recognition
  (numerals 1-5 in the first 2 stories 1-10 in the 3rd)
- compare quantities and develop language of more/ less/ many/ none
- develop comparative language for size – big and small; more and less
- recognition of words like 'more' 'less' 'big' 'small'
- develop a patterned sense of bonds to 5 (i.e. 5-0; 4-1; 3-2; 2-3; 1-4; 0-5 and bonds to 10 - 3rd story)
- use written tallies and/or numbers to represent the patterned story of how the 'number of …' changes in each place in each stage of the story (extension for learners ready for this aspect)

The method of working with the stories with learners will encourage learners to:

- Focus on pictures, numerals and words and speak the key words and number names as the story unfolds
- Act out with facial expressions emotions and feelings communicated in the story
- Have a conversation with the reader
- Predict what might happen next
- Tell their own stories using story-boards and puppets
- Tell their own stories using their fingers to represent the number of monkeys in different trees etc.
- Do imitative reading where they 'read' the story to others in the class

Cognitive control activities: finger discrimination

In the first session we discussed 3 key cognitive control functions that need to be developed in young learners. These were i*nhibition, flexibility* and *working memory*.

In this session, we focus on *finger discrimination*. Jo Boaler talks about the benefits of *visual mathematics* as seeing for understanding:

> "*when students learn through visual approaches, mathematics changes for them, and they are given access to deep and new understandings*"

Jo points out that the of our fingers in the early years is one of the key ways that we build visual mathematical understanding as fingers can be regarded as the link between numbers and their symbolic representation.

- Our brain uses representations of fingers, well beyond the time and age that people use their fingers to count. We "see" a representation of fingers in our brains, even when we do not use fingers in a calculation
- Counting numbers on fingers in the early years is important for brain development and future mathematics success.
- It is important that schools help learners **discriminate** between their fingers through the use of finger-based activities.

The *finger discrimination* activities in this session encourage development of:

- **Inhibition**: in terms of learner ability to suppress an automatic response of using a dominant hand or finger
- **Shifting attention**: ability to shift attention flexibly to using different fingers and different paths (among many)

This section provides details of the activities that are be presented in this workshop.

Every workshop will have a similar section so you know where to look in the handbook.

Resources

Reflection Activity

Get into groups of 3-5 teachers who are from a different school to you.

Reflect on your use of the following activities from the last session. Make notes in the space below.

- Duplo (Six Bricks) activities
- Egg carton activities
- "I Spy" activities
- Waku-Waku game

Use these questions to guide your reflection and discuss:

1. Have you tried the games/activities in your classroom?
   Explain - discuss
2. How did you organise the children to play the games?
   Explain - discuss
3. Were there any aspects of the activities/games that you adapted that you would like to share with the community?
   Explain - discuss
4. Will you use the activity/game again? Why?
   Explain - discuss

NOTES:

Finger Maze 1

The finger maze[1] you receive today is the first in a set that focuses on finger discrimination and encourages finger use for your learners.

Mathematical object of learning:	***You need***:
Build finger differentiation, which is important for developing numerical and visual mathematical understanding ***Skills***: • Inhibition and shifting attention • Colour differentiation • Descriptive vocabulary such as *up, down, left, right, curved, straight, around*	• Small coloured stickers for children's fingers in blue, green and red • Finger Maze 1 (laminated) ***For extension*** • Crayons (red, blue and green) • Scrap paper

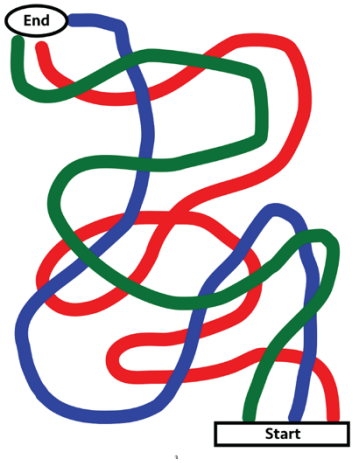
Directions:

1. Use the laminated mazes to work in small groups on the mat.
2. Put a coloured dot on each child's fingernail as shown in the diagram.
3. Have the child match their red index finger to the red path in the maze and **slowly** trace the path to the end. Help the child focus on the path and not speed along.
4. Each path should be traced slowly and take several seconds.
5. Next trace the green path with the matching finger.
6. After a child uses their dominant hand to trace all of the paths in the maze ask them to use their other hand.

youcubed at Stanford University

Finger Maze 1

Observe if learners struggle with any particular finger or hand. Let them practice more with the fingers and hands they struggle with.



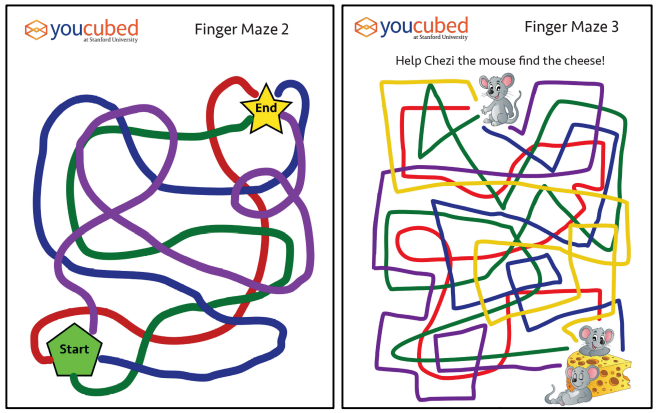
Extension ideas:

1. After children have used both hands and all fingers, get them to re-trace each coloured path.
   This time encourage them to try and describe <u>how</u> their finger moves along the path using words like *up, down, left, right, curved, straight, around* and so on.
2. Learners can also draw their own paths from a common start and end point in blue, green and red.
   Mark the common start and end points for them on their pieces of scrap paper.
   They can then trace their own paths and swop their paths with other learners.

[1] Youcubed finger mazes adapted from Gracia-Bafalluy, M., & Noël, M. P. (2008). Does finger training increase young children's numerical performance? Cortex, 44(4), 368-375.

Finger Mazes 2 and 3

Below are two more finger mazes that focus on finger discrimination and encourage finger use.

Mathematical object of learning: Build finger differentiation, which is important for developing numerical and visual mathematical understanding ***Skills***: • Inhibition and shifting attention • Colour differentiation • Descriptive vocabulary such as *up, down, left, right, curved, straight, around*	***You need***: • Small coloured stickers for children's fingers in red, blue, green, purple, yellow • Finger Mazes 2 & 3 (laminated) ***For extension*** • Crayons (red, blue, green, purple, yellow) • Scrap paper	

Instructions:

7. Use the laminated mazes to work in small groups on the mat.
8. Put a coloured dot on each child's fingernail as shown in the diagram.
9. Have the child match their red index finger to the red path in the maze and **slowly** trace the path to the end. Help the child focus on the path and not speed along.
10. Each path should be traced slowly and take several seconds.
11. Next trace the green path with the matching finger.
12. After a child uses their dominant hand to trace all of the paths in the maze ask them to use their other hand.

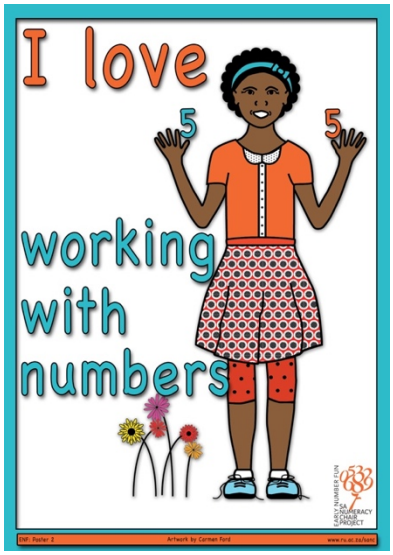
Observe if learners struggle with any particular finger or hand. Let them practice more with the fingers and hands they struggle with.

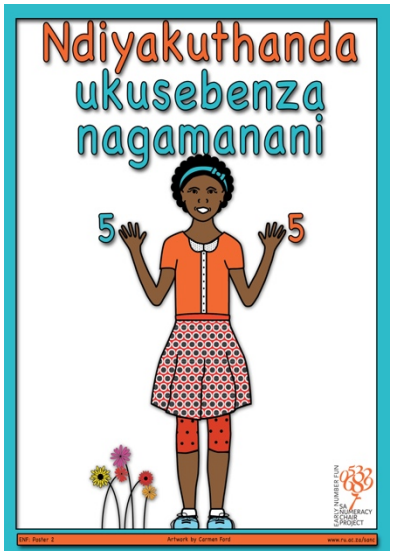
Extension ideas:

3. After children have used both hands and all fingers, get them to re-trace each coloured path. This time encourage them to try and describe <u>how</u> their finger moves along the path using words like *up, down, left, right, curved, straight, around* and so on.
4. Learners can also draw their own paths from a common start and end point in red, blue, green, purple, yellow.
   Mark the common start and end points for them on their pieces of scrap paper.
   They can then trace their own paths and swop their paths with other learners.

I love working with numbers

In this session, you will receive one of these posters to display in your classroom.





Learner discussion

As you put this poster up, you could have a discussion with the learners about this.

- Perhaps you and your class could think of a name for this girl such as Busi

- Ask the learners:
  - "How many fingers does Busi have up?"
  - "How many fingers on one hand?"
  - "Can you show me the same number of fingers as Busi?"
  - "How do you think Busi uses numbers in her life?"
  - Why do you think Busi loves working with numbers?"
- Ask the learners:
  - "Do you love working with numbers?"
  - "How do you use numbers?"

- Point out the '5' number symbol above her hands
- Ask the learners to count the flowers and talk about their colours
- Talk about Busi's positive attitude and ask the learners to read along as you point to the words "I love working with numbers".

Learner assessment activities

The assessments are intended to be formative and are aimed at helping you establish where your learners are in their mathematical learning and how to encourage them to progress. Remember, not all children will be able to do all the tasks, this is the point of the assesment.
The assessments assess a variety of concepts:

Checklist 1	**Checklist 2 - Grade 1 (number range to 10)**	**Checklist 2 - Grade 2 (number range to 20)**
• Verbal counting (forwards and backwards) • Numeral identification • Numeral sequencing	• Counting visible items • Counting screened items (addition and subtraction)	• Counting visible items • Counting screened items (addition and subtraction)
Assessing: • *Number word sequecing* • *Number identification*	*Assessing Counting / Early Arithmetic strategies*	

The assessment checklist and recording notes will be provided separately.

Preparation

- Photocopy the assessment sheets for yourself. You have master copies in your folders.
- Assemble the resources needed for the assessment onto a tray or into a box:
    - Counters (approximately 20)
    - A piece of paper or card to screen counters
    - Small numeral cards
    - Clipboard / something hard to lean on
    - Pen or pencil
    - Place assessment schedule on clipboard and write down the learner names

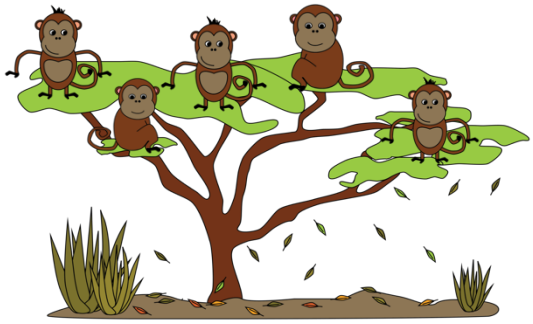
Administering the assessments

We suggest that you can do these assessments with children on a one-to-one basis.
Rather than assessing the whole class, we suggest selecting 3 of your strongest learners, 3 of your average learners, and 3 of your weakest learners. This should give you a general indication of the abilities of the class as a whole.

Assess the same 9 children in **March** and again in **October**.

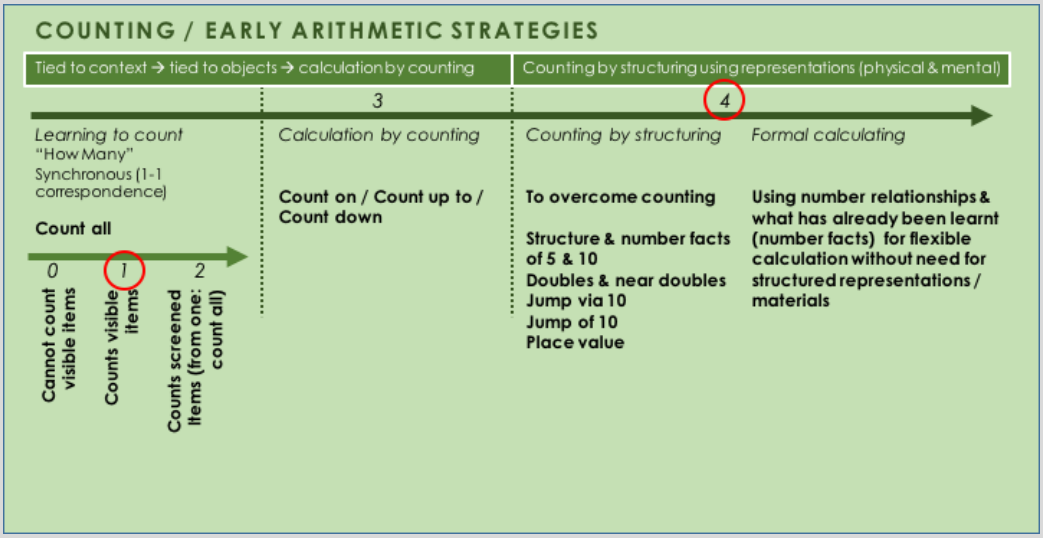
- Find a spot in the classroom where you can work with one learner on the mat or at a desk.
- Bring your tray of assessment resources to that spot
- Bring learners to the spot where you will be asking them the questions
- Fill in the assessment schedule according to learner responses

Story-based activities – 5 monkeys in a tree



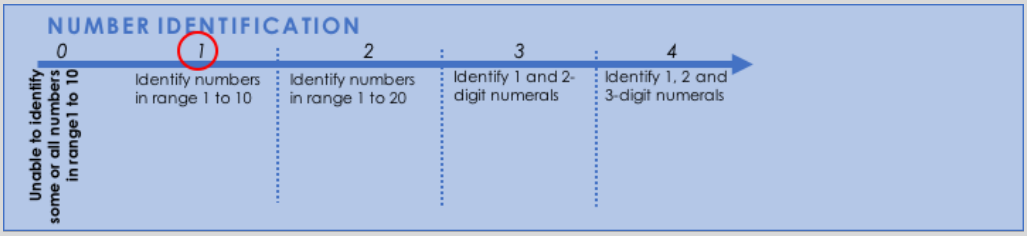
COUNTING: Progression focus for the following activities

Progression level	Progression focus	Number range / other
1	Learning to count	Numbers 1 to 5
4	Counting by structuring	Numbers 1 to 5

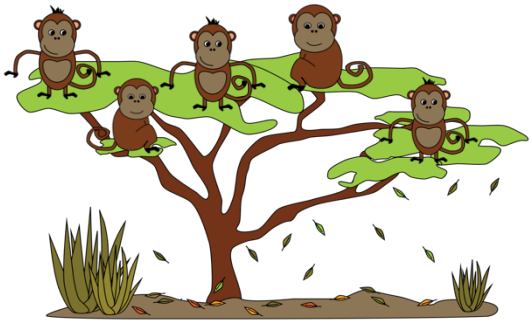


NUMBER IDENTIFICATION: Progression focus for the following activities

Progression level	Progression focus	Number range / other
1	Learning to count	Numbers 1 to 5



Story-based activities – 5 monkeys in a tree



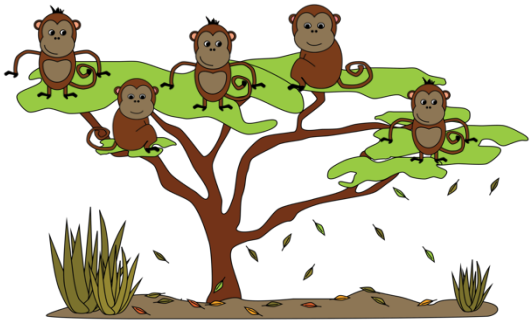
Getting started with the story book

First read the story to your learners. This could be with the whole class on the mat or with smaller groups of learners on the mat while other learners are occupied with other activities.

- As you read,
    - pause to ask the questions such as
        - "which tree has more or less monkeys?"
    - encourage learners to use expressions to act out the story
    - Allow learners to point to the story. It is laminated so they can touch it. For example, when counting the monkeys in the tree.
    - Point out the words – **more**, **less**, **big**, **small** and the **numeral** and **number** words on each page that describe what is happening.
      Ask learners to repeat these words as you point to them.

NOTES:

Story-based activities – 5 monkeys in a tree



Re-enact the story

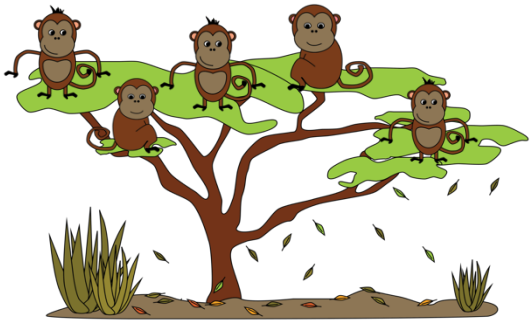
Now get learners to re-enact the story from memory.

- Have one learner be the **small** tree holding 5 monkeys (using five puppets).
  Have another learner be the **big** tree (s/he can stand on a chair to be taller) – at the start this learner has no monkeys.
  Allow another learner to be the one moving the monkeys between the trees.
- Point to the 'small tree' and say to the learners "here are the 5 monkeys in the small tree and no monkeys in the big tree like at the start of our story – do you agree? Are there 5 here?".
- Ask individual learners to put the word cards and number cards at the feet of the 'trees'
  - i.e. more; big and 5-five at the foot of the small tree and less; small; and 0-zero at the foot of the big tree.
- Ask the other learners if they agree with the cards placed by the trees.
- Then ask learners what happened next in the story.
- The learner tasked with moving the monkeys takes the one monkey from the small tree to the big tree.
- Now ask learners "How many monkeys are there now in each tree? Which tree has more monkeys?"
- At each stage ask the learners: "How many monkeys are there altogether in both trees?".
- Ask learners to change the cards at the bottom of each tree.
  The card for the size of the tree will stay and the more and less will stay until the 3rd monkey jumps.
- Continue like this for each stage of the story.

It is important to emphasise that there are always 5 monkeys and they are shared between the trees in different combinations of 5.
i.e. 5 and 0; 4 and 1; 3 and 2; 2 and 3; 1 and 4; 0 and 5.

NOTES:

Story-based activities – 5 monkeys in a tree



POST STORY CONSOLIDATIONS
These activities can be done in the days and weeks following these activities.

Flashcards and fingers

Resources required:	**Skills:**
Numeral and number word flash cards	Numeral and number word recognition, relating fingers with the numerals and words.

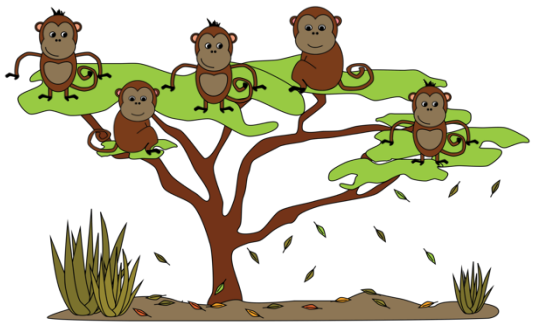
- Using a flash card, ask learners: "Show me this many fingers".
- Once learners can recognise the words and numerals together switch to hiding the numeral and focusing only on the word recognition.

Finger puppets

Resources required:	**Skills:**
Crayons, prestik, glue or sellotape, scissors Sheets of monkeys (5 monkeys per learner)	Numeral and number word recognition, relating fingers with the numerals and words. The colouring and cutting is also important for developing fine motor co-ordination.

- Get learners to colour in 5 monkey puppets and then cut them out to turn them into a finger puppet using prestik, glue or sellotape.
- Learners put the 5 monkeys on one hand and then using their hands, they 'act out' each part of the story, step-by-step.
- The one hand with the 5 monkey puppets and the other with no monkeys represents the start of the story with 5 monkeys in the small tree and no monkeys in the big tree.
- Ask learners to remember what happened next in the story and get them to 'act it out' by moving the monkey puppets one at a time to the other hand.
- At each stage ask: "How many monkeys in the small tree? How many monkeys in the big tree? How many monkeys altogether?"

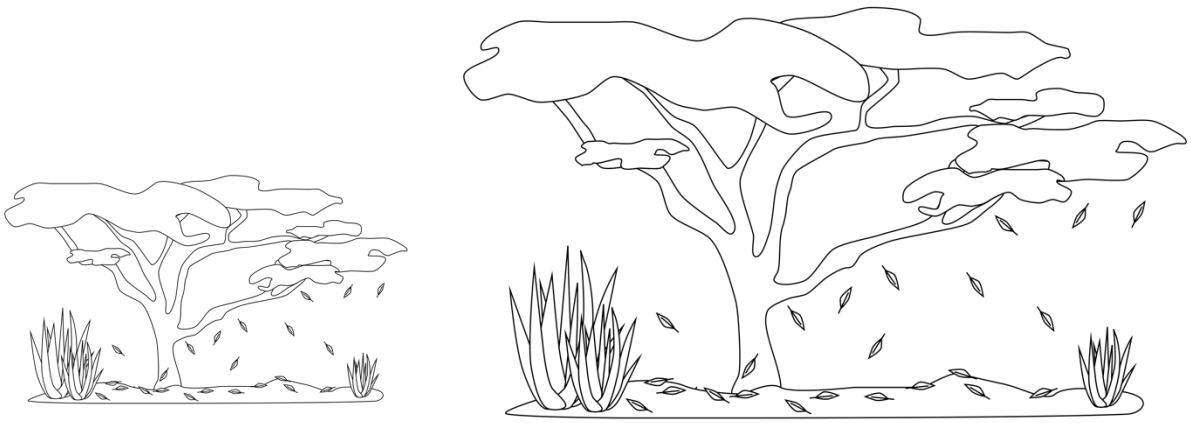
Story-based activities – 5 monkeys in a tree



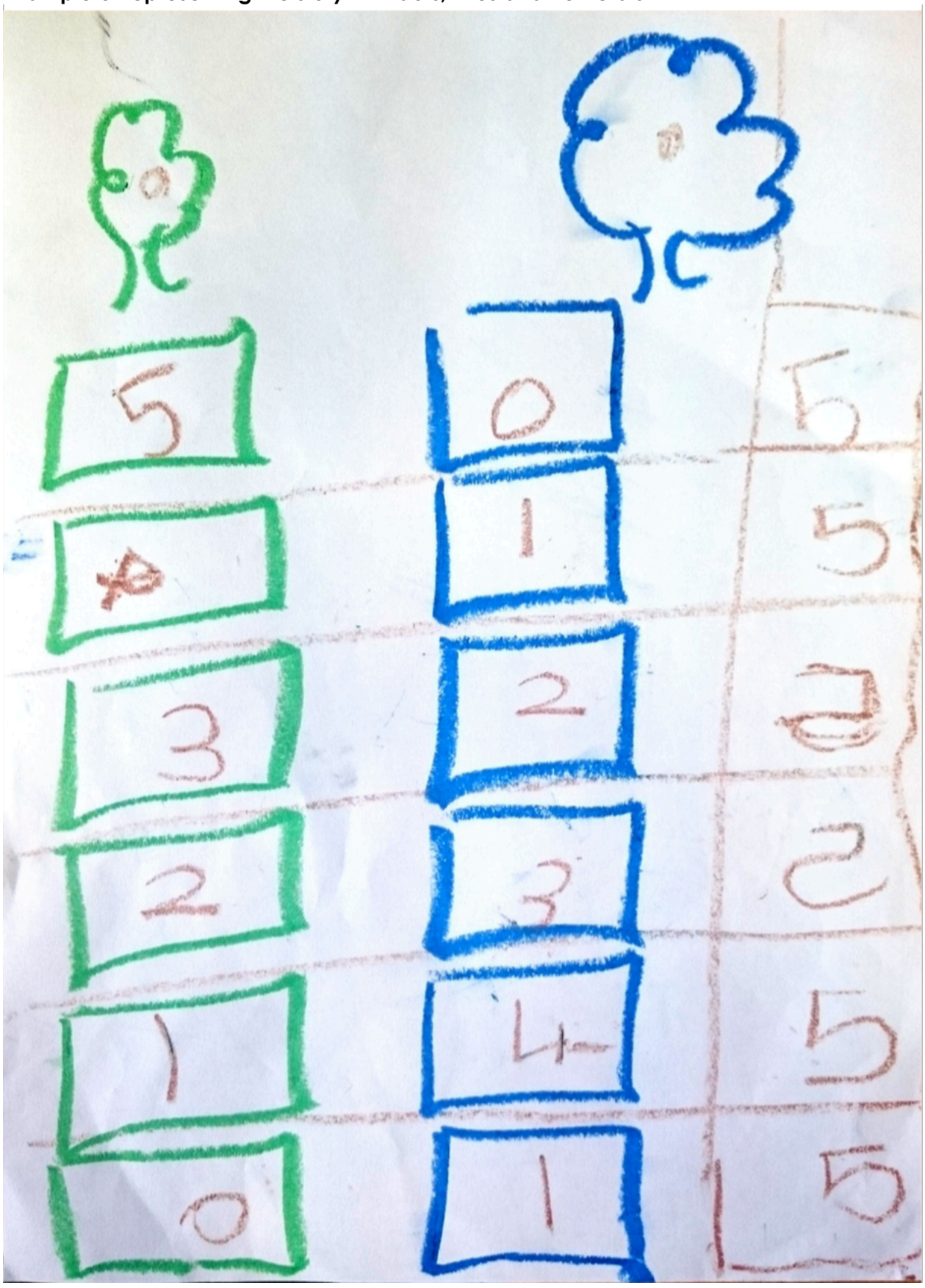
Extension activities
Below are some ideas for extending the learning using other activities.

1. For learners who are easily managing to act out the story with finger puppets, encourage them to begin to show the story with only their fingers (no puppets). In this case you are progressing them to object-based counting as fingers represent the monkeys.
   Emphasise the jumping movement with "wheeeee" as a finger on one hand goes down and then appears on the other hand.
2. Encourage learners to tell other students the story using the final blank tree page of the story book. Learners can place their coloured monkeys on the trees using prestik and then move them from one tree to the other as they tell/enact the story
3. Some learners may be ready to represent the story stages by drawing dots or lines for monkeys or writing numbers to show what happens each stage of the monkey story. You can give them a template (see next page for a template) for the story or allow them to come up with a way to draw the story their own way. Encourage the learners to see the pattern in the number representations down each column.
   The next page shows an example of what one pair of learners did after working with the story in the way described above.
4. Encourage learners to 'read' the story to you or to other learners as they show each page to the audience. Such imitative reading is a first step towards reading.
5. Of course other learning can be integrated across the story activities based on discussion of the monkeys:
   - "Have they seen monkeys before – if so where?"
   - "Why do monkeys often live in trees?"
   - "What colour is a monkey's fur?"
   - "What do monkeys eat?"
   - "How many fingers and toes do monkeys have?" and so on.

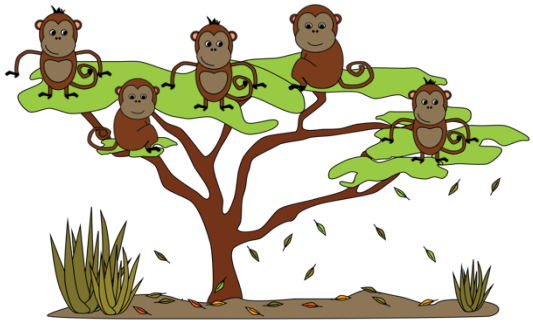
Template



Example of representing the story with dots, lines and numerals

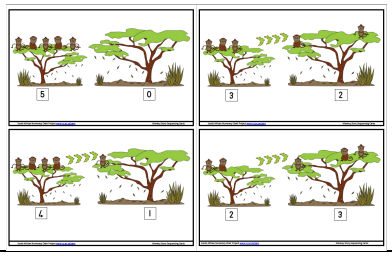


Supplementary activities – 5 monkeys in a tree



Based on feedback from Grade R educators over 2016, these supplementary activities for the "5 Monkeys in the tree" book have been developed.

Sequencing Cards

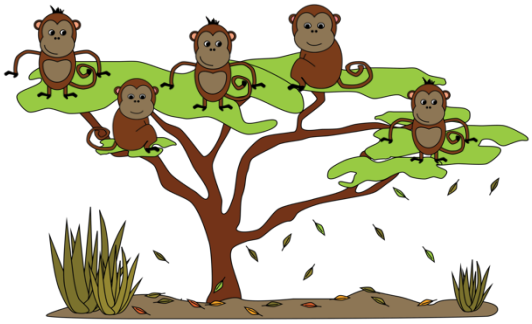
Skills:	***For each learner / pair, you need***	***Work with:***
• Ordering and sequencing in a logical way • Working with the ordinal sequence • Reinforcing mathematical concepts from the story • Encourages language development • Encourages learners to express their thinking	• One set of sequencing cards 	• We suggest learners work individually or in pairs on the mat

This activity helps the children to order and sequence events in a logical manner, it helps to reinforce the mathematical concepts from the story, encourages language development and expressing their thinking, as well as introduces the ordinal number sequence.

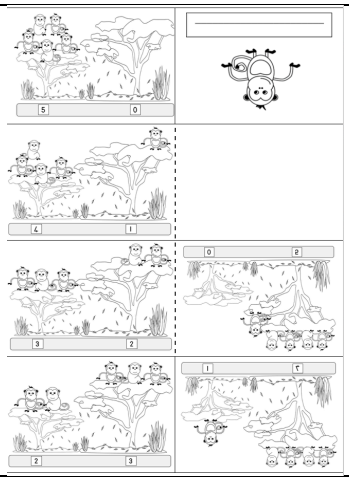
Once your children are familiar with the story, working individually, in pairs or in a small group with the teacher, children can be asked to "tell the story in order, using the cards".

- First discuss each of the components on the cards – draw children's attention to the small tree, the big tree, the monkeys (count them) and the number symbols.
- Shuffle the cards and give them to the learners
- Then ask them to remember back to the story and to identify which one comes **first.**
- Discuss why they chose that card.
- Then ask them to identify which comes **next, after, 'and then?'** or use the ordinal number words: **second, third, fourth, etc.**

Supplementary activities – 5 monkeys in a tree

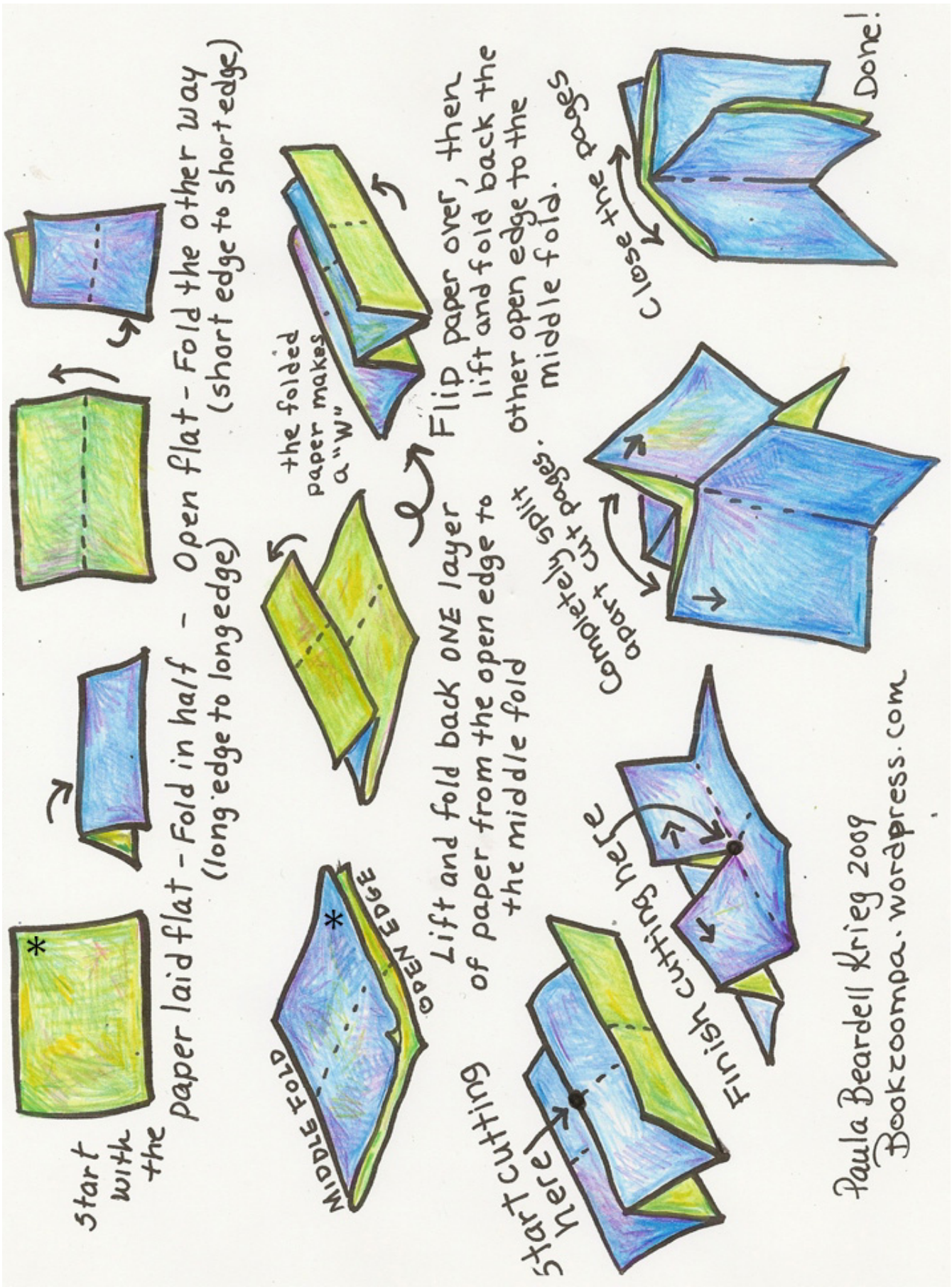


Mini-folded books for learners

Skills: • Listening • Fine motor skills (in the folding and colouring process)	***For each learner, you need*** • One A4 sheet for folding • Crayons ***For yourself, you will need:*** • A sample sheet to use for demonstrating • To be familiar with the folding instructions (see next page)	

- Give each child a A4 page.
- Using your own copy, talk them through folding the book one step at a time.

How to fold


Start with the paper laid flat
Fold in half - (long edge to long edge)
Open flat - Fold the other way (short edge to short edge)
MIDDLE FOLD
OPEN EDGE
Lift and fold back ONE layer of paper from the open edge to the middle fold
the folded paper makes a "W"
Flip paper over, then lift and fold back the other open edge to the middle fold.
Completely cut pages apart
Close the pages
Done!
Start cutting here
Finish cutting here
Paula Beardell Krieg 2009
Bookzoompa.wordpress.com

Creative activities

Finger puppets

The finger puppets can be used as representations for enacting the Early Number Fun Story books on their fingers and on the blank pages for telling the story at the end of the book.

Making the puppets

Resources required: Photocopies of monkeys Crayons Scissors Prestik, glue or sellotape	Development of colouring skills, fine motor coordination (cutting skills), imagination and creative play

1. Give each learner a strip of 5 monkeys
2. Allow learners to colour each monkey
   Learners might want to colour the main monkey talking in the story a different colour to the others or put the first letter of the monkey's name on it
   i.e. M for Minky Monkey, A for Annie Apie or I for Inki Inkawu
3. Get learners to cut out each monkey (with a big square so that it can be rolled into a finger puppet.
4. Get learners to stick each rolled puppet with a piece of prestik, glue or sellotape
5. Get the learners to place the puppets onto their fingers